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IN REPLY REFER TO
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OPNAV INSTRUCTION 9010.343B

Subj: APPROVED TOP LEVEL REQUIREMENTS (TLR) FOR OCEANOGRAPHIC
SURVEY SHIPS (T-AGS 60 CLASS)

Encl: (1) Oceanographic Survey Ships, T-AGS 60 Class Top
Level Requirements

1. Purpose. To revise the approved Top Level Requirements (TLR) for the Military Sealift Command-operated Oceanographic Survey Ships (T-AGS 60 Class).

2. Cancellation. OPNAVINST 9010.343A.

3. Applicability. These Top Level Requirements are applicable to three T-AGS 60 Class ships currently under construction and any follow ships in this class.

4. Discussion. This TLR is revised to differentiate T-AGS 60 Class requirements from those of the university-operated AGOR 24 oceanographic research ship, issued by OPNAVINST 9010.345. T-AGS 60 Class and AGOR 24 TLRs are currently combined. This combination is difficult to interpret due to the differences in ship operators and sponsors' mission equipment. The revised TLR also reflects installation of the Global Maritime Distress and Safety System (GMDSS) and clarification of Dynamic Positioning System (DPS) requirements and mission systems government procurements.

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OCEANOGRAPHIC SURVEY SHIPS, T-AGS 60 CLASS

TOP LEVEL REQUIREMENTS

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- B T-AGS 60 Class Mission Sponsor Equipment

1. OVERVIEW

1.1 Objectives and Scope

a. This document specifies the Top Level Requirements (TLR) for the Military Sealift Command (MSC) operated Oceanographic Survey Ships (T-AGS 60 Class). Included are the ship's mission, operational requirements, major configuration constraints, the plan for use, the maintenance concepts, the supply support concepts, and minimum operational standards.

b. The objective of the T-AGS 60 Class Ship Acquisition Program is to acquire oceanographic survey ships to meet world-wide oceanographic and data collection requirements.

c. The format of this TLR has been developed in accordance with the requirements of OPNAVINST 9010.300A. After this TLR is issued, serialized changes will be made to issue any changes to these requirements.

1.2 Constraints

If the provisions of this TLR cannot be met, the Commander, Naval Sea Systems Command will so advise the Chief of Naval Operations (N096).

1.3 Design Guidance

a. The T-AGS 60 Class ships are to be built to commercial standards and shall comply with all the applicable laws of the United States and the requirements of the regulatory bodies, American Bureau of Shipping (ABS), United States Coast Guard (USCG), SOLAS '74 (as amended), Global Maritime Distress & Safety System (GMDSS), 46 CFR Subchapter U (Oceanographic Ships), U.S. Public Health Service and Federal Communications Commission. The ships shall be classified by ABS to (MALTESE CROSS) A1 CIRCLE E (UNRESTRICTED OCEAN SERVICE), (MALTESE CROSS) AMS, (MALTESE CROSS) ACCU, and Class C ice strengthening (1989 ABS Rules for Building and Classing Steel Vessels).

b. The ships will satisfy all the requirements to obtain certifications for transit of the Suez Canal and Panama Canal.

c. Design shall include emphasis on economy of operation. Compliance with the General Specifications for Ships of the U.S. Navy, NAVSEA Technical Manuals, or other military requirements, is not required except as noted here.

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2. MISSION STATEMENT

2.1 Mission. The mission of the Oceanographic Survey Ships (T-AGS 60 Class) is to provide general purpose oceanographic capabilities in coastal and deep ocean areas. Typical missions may include:

- a. Physical, Chemical and Biological Oceanography
- b. Multi-discipline Environmental Investigations
- c. Ocean Engineering and Marine Acoustics
- d. Marine Geology and Geophysics
- e. Surveys (bathymetry, gravimetry, and magnetometry)

2.2 Primary Tasks. To carry out the mission the T-AGS 60 Class shall be capable of performing the following tasks:

- a. Oceanographic sampling and data collection of surface, midwater and ocean floor parameters using state-of-the-art scientific instrumentation.
- b. Launch, recovery and towing of scientific packages, both tethered and autonomous, including the handling, monitoring and servicing of remotely operated vehicles.
- c. Shipboard Oceanographic data processing and sample analyses in modern well-equipped scientific laboratories.
- d. Precise navigation, trackline maneuvering and station keeping to support deep ocean and coastal surveys.

2.3 Secondary Tasks. The T-AGS 60 Class ships have no wartime mission.

3. TOTAL SHIP REQUIREMENTS AND CHARACTERISTICS

3.1 Command, Control and Communications. Facilities shall be adequate for scientific and survey operations and shall include:

- a. Ship handling and maneuverability to permit dynamic positioning, station keeping, and the launch and recovery of large scientific packages and vehicles.
- b. Manual and automatic steering control, precision track line and positioning-keeping.

c. The pilot house shall be at or near amidships. The bridge wings shall be open and shall include gyro repeaters, rudder angle indicators and shaft RPM indicators. Satisfactory visibility from pilot house forward and from bridge wings forward and aft is required. The functions, communications, and layout of ship control must allow the close interaction of ship and science operations.

d. Navigation, communication, and IC systems are listed in Appendix A.

3.2 Acoustic Characteristics

a. The shipboard acoustic systems are identified in the appendices. Reduction of hull induced flow noise and bubble-sweepdown shall be within the current state-of-the-art for this type of acquisition. All installed sonars will operate at ships speeds up to 12 knots in Sea State 4.

b. The choice of shipboard hull and machinery systems, their locations, and their installation shall reduce impact on the shipboard acoustic systems. These installations shall be within the current state of the art for this type of acquisition.

c. The T-AGS 60 Class shall meet the same airborne noise level criteria as the AGOR 23. In addition, for the main weather deck (except when deck machinery is operating), speech communications must be possible over moderate distances. Laboratories and interior scientific working spaces shall be sound insulated to maximize communication within these spaces.

d. Quiet ship/drift operation: The ship shall be capable of accommodating a self-contained minimum 100 kW electrical generator to maintain basic scientific and ship's service loads for a period up to 6 hours duration. This capability meets the requirements for occasional quiet mission operations.

3.3 Survivability, Including Passive Protection

a. Survivability provisions shall be under regulatory body requirements for oceanographic ships.

b. All radiators and receptors of electromagnetic energy and related electronics shall be designed and installed to ensure electromagnetic compatibility (EMC) and to avoid hazards of electromagnetic radiation to personnel (HERP) and fuels (HERF). Automated control systems shall not respond spuriously to electromagnetic interference (EMI) from radiating sources or to transients on power lines.

c. The ships shall meet all applicable safety requirements of the regulatory bodies.

d. Damage Control will meet MSC requirements. CBR is not required.

3.4 Mobility. A sustained speed of 15 knots is required. The ships shall be capable of 12,000 nm at 12 knots plus 29 days at 3 knots. A 10 per cent fuel reserve shall be provided based on total fuel required.

3.5 Operating Environment. The T-AGS 60 Class shall operate as required in worldwide service, and perform its mission under a range of weather conditions from tropic to subarctic.

3.5.1 Temperature and Humidity. Habitability areas and mission essential spaces shall be air conditioned and shall be designed for a maximum external air temperature of 95 degrees Fahrenheit dry bulb (82 degrees Fahrenheit wet bulb), with a maximum sea water temperature of 95 degrees Fahrenheit, and a minimum external air temperature of 0 degrees Fahrenheit with a minimum sea water temperature of 28 degrees Fahrenheit. Air conditioning for all laboratory spaces and interior scientific operations spaces shall be designed to provide maximum of 75 degrees Fahrenheit with maximum humidity of 55 per cent. Heating for these spaces shall be designed to provide minimum of 70 degrees Fahrenheit. Other payload compartments, including scientific storage compartments, shall be designed to maintain 70-80 degree Fahrenheit dry bulb with maximum humidity of 55 per cent.

3.5.2 Wind and Sea Conditions

a. Safe transit of the T-AGS 60 Class at all speeds up to approximately 15 knots on all headings in seas up to 8.2 ft significant wave height, and at 10 knots on best heading in seas up to 12.2 feet significant wave height is required.

b. The ability to launch, operate and recover scientific equipment while holding position, with a wind speed of 27 knots and a 2 knot current at best heading, in seas up to 11.0 ft significant wave height is required.

3.6 Ship Utilization. The T-AGS 60 Class will have an irregular deployment cycle. The ships are expected to average 250 days per year at sea.

3.7 Maintenance, Overhaul and Supply Support Concepts

3.7.1 Logistics Support

a. The T-AGS 60 Class shall be capable of self-sufficiency for regular preventive maintenance. Onboard maintenance and repair capability shall meet USCG and ABS requirements. The T-AGS 60 Class shall be fully supported within the Navy supply system, including the use of a standard Navy Consolidated Ship Allowance List (COSAL) for both ship and MSC-supported mission sponsor equipment.

b. The T-AGS 60 Class shall be capable of limited emergency repair of hull structure and engineering casualties. Repair task areas include:

- (1) Limited repair of above-water hull structure.
- (2) Minor steering system and/or shafting repair.
- (3) Minor propulsion, auxiliaries and electrical repairs.
- (4) Substantial repair of scientific deck machinery and electronics.

c. Day-only, hover-only helicopter capability by commercial helicopter shall be provided for emergency medical and humanitarian evacuation.

d. The maintenance and overhaul concept for the T-AGS 60 Class shall be consistent with MSC practices, including use of a specially developed automated Preventative Maintenance System.

e. Regular drydocking and ship overhaul will be scheduled to maintain a valid USCG certificate of inspection and to maintain the ships in class with ABS.

3.7.2 Supply Support

a. The T-AGS 60 Class shall carry consumables for accommodation of 60 persons using MSC stowage factors as follows:

Dry Stores	90 days
Frozen	90 days
Chilled	45 days
Medical	120 days

b. Adequate stowage spaces shall be separately provided for deck, engine, medical, steward, and mission stores.

c. Support planning shall satisfy Navy policy on Integrated Logistics Support (ILS) as contained in SECNAVINST 5000.2A and

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OPNAVINST 5000.42D. Allowance lists for the T-AGS 60 Class shall be developed to sustain ship operation for 90 days without augmentation from external sources using the Modified Fleet Logistic Support Improvement Program (MOD FLSIP) model for the ship's allowance. The mission electronics shall be supported under an Integrated Logistics Support Plan (ILSP) to be developed and implemented by the Naval Oceanographic Office (NAVOCEANO).

3.8 Manning and Habitability

3.8.1 Manning. Manning shall be constrained to the accommodations stated here. Ship manning levels shall be established in order to comply with USCG regulations regarding minimum manpower requirements.

3.8.2 Accommodations.

Single SR:	8 Officer (private T/S)
	5 Chief Petty Officer (CPO) (semi-private T/S)
	<u>1</u> Scientist (private T/S)
	14 Staterooms
Double SR:	6 Crew (Semi-private T/S)
	<u>13</u> Scientist/Technician (Semi-private T/S)
	19 Staterooms
Spare:	1 Single (semi-private T/S)
	<u>1</u> Double (semi-private T/S)
	2 Staterooms

The T-AGS 60 Class shall be capable of accommodating 5 additional scientists in deck vans. A public T/S (toilet/shower) shall be suitably located in the van area. Adequate office space shall be provided to conduct the business of the ship (engine, deck, and supply/steward's department). Standards for messing and berthing spaces shall meet MSC habitability requirements.

3.8.3 Habitability Standards

a. A hospital space, exercise room, and self-service laundry facilities are required. A common galley for cafeteria style feeding shall be utilized.

b. The T-AGS 60 Class shall have two separate messing facilities; one for officers/scientists/technicians and the other for CPO and crew. Each messing facility shall include a lounge area for recreation and training purposes. The following are the

minimum mess seating requirements:

Officers	100 per cent seating
CPO and Crew	60 per cent seating
Scientists/Technicians	60 per cent seating

3.9 Flexibility for Change, Including Space and Weight Reservations

a. Design and outfitting shall provide for rapid scientific payload changes for ship turnarounds and redeployments. This includes optimum access to work and storage areas, and laboratory facilities to permit changeout of electronics and other laboratory internal equipment.

b. Service life allowance of five per cent of full load displacement and 0.5 foot of KG shall be provided.

4. SUBSYSTEM REQUIREMENTS AND CHARACTERISTICS

4.1 Hull Form and Structure. The ships shall have a hull shape, appendages and hull openings in compliance with paragraph 3.2a Acoustic Characteristics of this TLR. Interference shall be within the current state-of-the-art for this type of acquisition.

4.2 Propulsion System. The following specific capabilities and characteristics are required:

a. The prime movers shall be diesel engines, using marine diesel fuel.

b. An integrated electric propulsion and auxiliary service system is required.

c. The machinery plant shall be capable of continuously variable ship speed control (0-15 knots) without switching systems.

d. Economy of operation shall be considered during the design.

e. The machinery plant shall be designed for unattended operation. An air conditioned central machinery control space shall be provided for operation and monitoring of propulsion and auxiliary machinery and systems. The centralized control room shall be located within or adjacent to the machinery space boundary with suitable access provided.

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f. Bow thrusters shall be steerable jet or retractable propeller (faired) type to ensure minimum acoustic interference.

4.3 Electric Plant (Scientific purposes)

a. Provision shall be made for clean power to support a scientific load of approximately 100 kW including a 12 kW Uninterrupted Power Supply (UPS). Of the 100 kW total, a PACEL or equal regulated power unit (37 kW) shall be provided for scientific data processing/Automated Data Processing (ADP) systems.

4.4 Command, Surveillance, and Scientific Mission Requirements

a. Appendix B provides the list of Mission Sponsor Equipment.

b. The following scientific facilities shall be provided and, where practical, are to be located contiguous to one another in the area of the ship which experiences the least motion in a seaway.

(1) Deck - Working Area. Approximately 3,500 square feet (sq ft) total fantail working deck area is required. Working deck unit loading shall be 1,500 pound (lb)/sq ft. Working deck shall be 6 ft to 10 ft above the water line. All hatches on the working deck shall be flush type hatches. A disposable load of 72 tons, shall be accommodated at the working deck level and 28 tons in the Signal Underwater Sound (SUS) charge van locations.

(2) Vans. Additional deck area (working deck or 01 deck) for four 20 foot (ft) long International Standards Organization (ISO) standard vans shall be provided near the lab complex and working deck with direct access to the ship's interior. The deck area for vans on the working deck shall have a 1,500 lbs/sq ft unit loading. The ship cranes shall be capable of onloading and offloading the vans up to a weight of 20,000 lbs. Two of the van sites shall be configured for SUS charge storage, one van site to be configured to support a Quiet Ship/Drift Generator, and one van site shall be configured to support a seismic van.

(3) Laboratories. Approximately 4,000 sq ft of laboratory space shall be distributed among the following spaces: Main Lab, ET Shop, Dry Lab, Photo Lab (Dark Room), Wet Lab, Staging Bay, Drafting Room, Scientific Freezer, and Climate Controlled Room.

Rapid rearrangement and flexibility will be maximized by selective spaces being equipped with flush-deck boltdown fittings on two-foot centers and through the use of unistruts on overheads and bulkheads. Laboratory cleanliness is a major objective.

Materials which permit achievement of this objective will be used in the construction of these spaces. Furnishings, heating, ventilation and air conditioning (HVAC), doors, hatches, cable runs, and fitting will also be planned for maximum lab cleanliness. These spaces should have 9 to 11 air changes per hour. Laboratories will be furnished with 110 and 220 volt AC power. Uncontaminated sea water and fresh water, and clean oil-free compressed air supplies with appropriate drains will be provided in selective spaces.

(4) Scientific Storage. Two to four storage compartments with a combined total of approximately 15,000 cubic feet (cu ft) (135 tons accessible from both the weatherdeck and the ship's interior shall be provided. High density storage spaces should be located aft with access to working areas by hatches using ship cranes. Maximum total weight in high density spaces is 100 tons.

(5) Other Scientific Spaces. In addition to the laboratories, the following scientific spaces are required: a library/conference room (350 sq ft minimum); a gyrocompass room of about 70 sq ft minimum shall be provided near the ship's center of motion.

(6) Overside Handling. Handling gear to accommodate overside operations shall include the capability to carry, launch, and recover equipment on the starboard side from midships to stern, including a 50 ft core sampler.

(7) Mission-Related Deck Equipment. A suite of modern cranes, winches, stern A-frame, and other deck gear shall be provided to permit loading and unloading the ship without assistance to support a variety of oceanographic operations at sea, such as coring, water sampling, equipment implantation, and array and trawl towing. These equipments will be located throughout the working deck areas during the ship's life. Electric power shall be provided to the deck machinery alternative locations. A slack tensioning subsystem will be added to the towing winch system and the tow winch system shall be located below decks to protect the gear from the elements. Provision shall be made for the remote control of permanently installed mission-related winches from weather-protected enclosure(s) with maximum practicable visibility of the cable to the last overside block or sheave.

c. A Dynamic Positioning System shall be installed and be capable of the following:

(1) Maintain position within 300 ft radius with a 2 knot current, 27 knot wind, and seas up to Sea State 5;

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(2) Maintain trackline within plus or minus 300 ft at 0.5 to 2.5 knots with a 10,000 lb towing force over any track bearing while maintaining ships heading plus or minus 45 degrees to the trackline, trackline shall include multiple way points in any direction;

(3) Maintain ships heading (auto pilot) from 0 knots to full power;

(4) Accept navigational data from both Global Positioning System or the mission acquisition data processing system;

(5) Accept manual control from a joystick.

d. Ships shall be capable of continuous tow of large scientific packages up to 10,000 lb tension at 5 knots, and 20,000 lb at 2.5 knots.

e. Flush deck boltdown fittings shall be provided in a uniform grid pattern on 2-foot centers over the entire area of the working deck, staging bay, and van tie-down area.

f. Three 12-inch scientific sea chests for sea surface temperature and sound velocity and two 24-inch transducer tubes shall be provided, fore and aft near the centerline and extending from the weatherdeck through the hull.

4.5 Auxiliary Systems

a. The following specific capabilities and characteristics are required:

(1) Fresh water making capacity shall be provided consisting of a minimum of two units, each capable of providing in excess of 60 gallons per day accommodation (60 people). Stowage for not less than 120 gallons of potable water per person shall be provided. An additional 10 per cent watermaking and storage capacity shall be provided for lab use. A minimum of two potable water stowage tanks shall be provided.

(2) A clean ballast system will be provided. Dirty ballast shall not be permitted in any loading condition. Liquid ballast operations shall avoid partially full tanks in any hydrophone area.

(3) All overboard discharges shall be configured to restrict discharge to the port side of the ship.

(4) An uncontaminated sea water system shall be provided

with bow inlet and distribution to selected laboratories. Materials for this system shall not contribute to biological or chemical contamination.

b. The pollution emanating from the ship shall be controlled. A shipboard sewage system, including transfer system, marine sanitation devices, and holding tanks with 24 hour capacity shall be installed and shall meet USCG and Environmental Protection Agency (EPA) regulations. The sewage system shall be the vacuum type. Oily waste separation equipment shall be provided.

c. A combined workshop shall be provided for both ship and scientific use equipped with industrial sized equipment including lathe, drill press, grinder, milling capability and welding machines (electric and gas). The workshop shall be located adjacent to or within the engine room boundaries and be provided with suitable access for handling both ship and scientific equipment and material.

d. The stack exhaust shall be arranged to minimize airborne pollution of the shipboard environment and airborne noise on main and/or working decks.

e. Laboratories, working deck stations, and van installation sites shall be provided with appropriate services.

f. Thrusters shall be sized to meet positioning and trackline requirements. Control of thrusters shall be in the pilothouse.

4.6 Outfit and Furnishings. Shall follow USCG requirements and commercial standards.

4.7 Armament. Not applicable.

APPENDIX A

T-AGS 60 CLASS NAVIGATION, COMMUNICATION AND IC SYSTEMS

1. Infrared Facilities

None

2. Transmitting/Transceiving Facilities

- a. (1) 2-30 MHz Synthesized A1, A3A, A3J, A3H, F1; 1KW output PEP AQR (SITOR) (SELCALL)
- b. (1) Global Maritime Distress & Safety System (GMDSS)
- c. (1) 1.5-1.6 GHz INMARSAT

3. Receiving Facilities

- a. (1) Global Maritime Distress & Safety System (GMDSS)

4. Terminal Facilities

- a. (2) ASR Teletype (Part of 2a)

5. Radar Facilities

- a. (1) 10 cm Surface Search Radar (Raster Scan)
- b. (1) 3 cm Navigational Radar (Raster Scan), ARPA (Collision Avoidance)

6. Sonar Facilities

- a. (1) Shallow Depth Echo Sounder with Record Capability and Visual Indication (Navigation)
- b. (1) Doppler Speed Log (Dual Axis) in WHSE; (Input to Collision Avoidance, SATNAV, and gyrocompass)

7. Countermeasure Facilities

None

8. Navigational Facilities

- a. (1) Gyrocompass
- b. (1) SATNAV (GPS Capability with Remote) 4 Channel
- c. (1) Loran C (with Plotter)
- d. (1) Automatic Radio Direction Finder
- e. (1) Dynamic Positioning System
- f. (1) Dual Autopilot Steering Control

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APPENDIX A

T-AGS 60 CLASS NAVIGATION, COMMUNICATION AND IC SYSTEMS (Cont'd)

- g. (1) Magnetic Compass
- 9. Radiac Facilities
 - a. None
- 10. Remote Station Facilities
 - a. Wheel House
 - (1) Radar Display/Control of 10 cm Radar (16 inch)
 - (1) Radar Display/Control of 3 cm Radar (16 inch)
 - (1) Control of Collision Avoidance System
 - (1) Ship's Echo Sounder Display
 - (1) Loran C Remote Display
 - (1) INMARSAT R/T Remote
 - (1) Wind Speed and Direction Readout
 - b. Chart Room
 - (1) Display/Control of Ship's Echo Sounder
 - (1) Display/Control of Doppler Speed Log
 - (1) Display/Control of Automatic Radio Direction Finder
 - (1) Control/Display of Weather Facsimile
 - (1) Control/Display of Loran C (with plotter)
 - (1) Reception of Time Tick (from Communications Room)
 - (1) Mission Status Display
 - (1) Wind Speed and Direction Equipment
 - c. Communications Room
 - (1) Control of Radio Facilities
 - (1) INMARSAT Terminal
 - d. Scientific (Main or Computer) Laboratory
 - (1) Remote Display from Ship's Doppler Speed Log
 - (1) Display from Ship's Loran C
 - (1) Remote Display for Rudder (Thruster) Angle(s)
 - (1) Gyro Compass Repeater and data lines
 - (1) Anemometer Readout
 - (1) Remote from INMARSAT and High Speed data terminal
 - (1) Remote Display for shaft(s) RPM

APPENDIX A

T-AGS 60 CLASS NAVIGATION, COMMUNICATION AND IC SYSTEMS (Cont'd)

- (1) Control of Chart Room and Wheel house mission displays control/display
- (1) Display of Winch Line Readouts

11. Meteorological Facilities

Not applicable

12. IC Facilities

- a. Electronic IC System serving all operating spaces, laboratories, public spaces, working deck spaces, and four van stations
- b. Dedicated IC System serving Main Laboratory (Survey Control Center, Pilot House, Winch Control House, and Working deck aft).

Note: (1) FCC, INMARSAT, and USCG approve equipment shall be provided to satisfy these requirements, as applicable.

APPENDIX B

T-AGS 60 CLASS MISSION SPONSOR EQUIPMENT

1. ADPE Suite (Data Acquisition, Navigation and processing Systems)
2. Acoustic Doppler Current Profiler
3. Expendable Sensor System (XBT, XSV, XCTD)
4. Global Positioning System
5. High Resolution Multibeam Swath Sonar System
6. Subbottom Profiler
7. Wide Beam Deep and Shallow Water Sounding System
8. Seismic System
9. Meteorological Sensor Suite
10. Time Distribution System
11. Water Sampler System
12. Conductivity, Temperature, Depth (CTD) System
13. Bottom Transponder Navigation System
14. Magnetic Field Intensity Measurement System
15. Sea Surface Temperature System
16. Acoustic Release System
17. Special Laboratory Appliances/Facilities
 - Photo Lab Equipment
 - Scientific X-RAY Equipment
 - Fume Hood w/Hazardous Material Stowage Under
 - Sediment Velocimeter
18. One large Deck Service Crane
19. Two Articulated Cranes (one on center line for towing use)
20. Stern A-Frame (large)
21. Starboard Side Aft U-Frame
22. Starboard Side Mid-Ship Articulated J-Frame
23. Two Hydrographic Winches
24. One Trawl/Coring/Traction Winch System
25. One General Purpose Winch
26. Scientific Support Vans
27. Vertical Reference System
28. Work Boat (RIB)
29. Off-Line Secure Communications
30. One Magnetometer Winch
31. Two Hydrophone Streamer Winches